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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/533,509

Applicant(s)

BAKKERS ET AL.

Examiner

ABUL KALAM

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 November 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 November 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-8508)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date _____

DETAILED ACTION

Claim Informalities

The status identifier of claims 10-13 should be changed to --cancelled--, because the claims were cancelled in the reply filed on May 21, 2007.

Claim Objections

1. Claims 2-7 and 9 are objected to because of the following informalities:

In line 1 of claims 2-6, the limitation of "A nanostructure" should be amended to recite --The nanostructure--, because the limitation refers to the nanostructure which has already been claimed in claim 1.

Claim 5 is objected to for missing the preamble.

In line 1 of claim 7, the limitation of "A dispersion of nanostructures" should be amended to recite --A dispersion of at least one nanostructure--, because claim 1 recites "nanostructure," not "nanostructures."

In line 1 of claim 9, the limitation of "An electronic device" should be amended to recite --The electronic device--, because the limitation refers to the electronic device which has already been claimed in claim 8.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. **Claims 1-3, 6 and 8** are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukagoshi et al. (US 6,833,980, hereinafter, Tsukagoshi) in view of Moslehi (US 2001/0047760; newly cited).

With respect to **claim 1**, Tsukagoshi teaches a nanostructure of an inorganic semiconductor material (**col. 6, Ins. 24-27: "boron nitride"**) comprising:

a nanotube (**col. 6, Ins. 4-27**) with a crystalline mantle and a hollow core (**col. 3, Ins. 43-55**).

Thus, Tsukagoshi discloses all the limitations of the claim with the exception of explicitly disclosing wherein the crystalline mantle of the boron nitride has a crystalline structure of a diamond, a zinc blend or a wurtzite. However, Moslehi discloses that wurtzite or zinc blend crystalline structures for a boron nitride material is well known in the art (**¶ [0104]**). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to form the crystalline mantle with crystalline structure of wurtzite or zinc blend, because such structures are favored in the nano-crystal form.

With respect to **claims 2 and 3**, Tsukagoshi and Moslehi teach all the limitations of claim 1, including wherein the nanotube has a diameter in the range of 1.4-2.0 nm. However, Tsukagoshi does not explicitly disclose wherein the hollow core of the nanotube has a diameter in the range of 2 and 20 nm, nor wherein the mantle of the nanotube has a thickness in the range of 1-20 nm.

However, it has been held that where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover optimum or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 105 USPQ 233, 234 (CCPA 1955). Furthermore, where patentability is based upon particular chosen range or dimension recited in a claim, the Applicant must show that the chosen range or dimension is critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to form the hollow core with a diameter and the mantle with a thickness, in such a range as claimed, because the range is not critical since it can be optimized depending on the desired properties of the nanotube.

With respect to **claim 6**, Tsukagoshi teaches wherein the inorganic semiconductor material is chosen from the group of III-V semiconductor materials (**col. 6: Ins. 24-27**).

With respect to **claim 8**, Tsukagoshi teaches An electronic device comprising a first and second electrode (**3 and 4, Fig. 1; col. 3: Ins. 26-42**) which are mutually connected through at least one nanostructure (**col. 3: Ins. 43-55**) according to claim 1.

3. **Claim 4** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukagoshi ('980) and Moslehi ('769), as applied to claim 1 above, and further in view of Chen et al. (US 2003/0129122, hereinafter, Chen).

With respect to **claim 4**, Tsukagoshi and Moslehi teach all the limitations of the claim, including wherein the crystalline mantle comprises a compound semiconductor

(**Tsukagoshi: col. 6, Ins. 24-27**). Thus, all the limitations are taught with the exception of wherein the hollow core is partially filled with the compound semiconductor material.

However, Chen teaches that nanotubes filled with metals or semiconductors may provide components for nanoscale electrical or electronic devices (**¶ [0004]**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the nanostructure of Tsukagoshi and Moslehi, with the teaching of Chen, to fill the nanotubes with the compound semiconductor material, in order to form a variety electrical components (**¶ [0004]**).

4. **Claim 5** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukagoshi ('980) and Moslehi ('769), as applied to claim 1 above, and further in view of Crespi et al. (US 2004/0004212, hereinafter, Crespi).

With respect to **claim 5**, Tsukagoshi and Moslehi teach all the limitations of the claim, as set forth above in claim 1, with the exception of disclosing wherein the nano structure comprises a first zone with a p-type doping and a second zone with an n-type doping, the first and second zones having a mutual interface constituting a pn-junction.

However, Crespi teaches a nanostructure in which nanotube sections can be doped to form a pn-junction (**¶ [0044]**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the nanostructure of Tsukagoshi and Moslehi, with the teaching of Crespi, to form a nanotube comprising a pn-junction, in order to provide elements to manufacture nanoscale semiconductor devices (**¶ [0099]**).

5. **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukagoshi ('980) and Moslehi ('769), as applied to claim 1 above, and further in view of Glatkowski et al. (US 2004/0071949; hereinafter, Glatkowski).

With respect to **claim 7**, Tsukagoshi and Moslehi teach all the limitations of the claim as set forth above in claim 1, with the exception of disclosing a dispersion of nanostructures in a solvent.

However, Glatkowski teaches that a nanotube-containing layer may be easily formed and applied as a dispersion of nanotubes in a solvent (**¶ [0053]**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Tsukagoshi and Moslehi, with the teaching of Glatkowski, in order to form conformal coatings which comprise nanotubes, for the purpose of providing EMI shielding (**Glatkowski: ¶ [0017], [0033]**).

6. **Claim 9** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukagoshi ('980) and Moslehi ('769), as applied to claim 1 above, and further in view of Urayama et al. (US 6,650,061, hereinafter, Urayama).

With respect to **claim 9**, Tsukagoshi and Moslehi teach all the limitations of the claim as set forth above in claim 1, with the exception of disclosing an electronic device characterized in that an insulating substrate with pores that are mutually substantially parallel is present, wherein the pores extending from a first electrode to a second electrode, wherein the nanostructure are provide in the pores.

However, Urayama discloses an electronic device comprising a first and second electrode (**2 and 7a, Fig. 1a-1b; col. 6: ln. 15**) connected through at least one

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nanostructure (**6; col. 6: Ins. 27-30**), and an insulating substrate (**4; col. 6: Ins. 18-21**) with pores (**5, Fig. 1b**) that are substantially parallel, wherein the nanostructures (**6**) are provided in the pores (**Fig. 1b**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Tsukagoshi and Moslehi, with the teaching of Urayama, in order to form an electronic device, such as an electron source array comprising very fine, uniform emitters (**Urayama: abstract**).

Response to Arguments

7. Applicant's arguments filed November 21, 2007 have been considered but are not persuasive.

Regarding the Tsukagoshi et al. (US 6,833,980) reference, Applicant argues:

"The rejection under this subsection of the Code is improper based on the filing date of the present application and the filing/issue dates of the applied art. For at least this reason, the rejection is of improper basis and should be withdrawn."

The Tsukagoshi reference was filed on February 15, 2000, and applicant's effective filing date is November 5, 2002. Thus, the Tsukagoshi reference was filed more than two years before the instant Application. Note the conditions for prior art under section 35 USC 102(e):

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The rest of Applicant's arguments, regarding to claims 1-9, have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **ABUL KALAM** whose telephone number is (571)272-8346. The examiner can normally be reached on **Monday - Friday, 9 AM - 5 PM**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Wael M. Fahmy** can be reached on **571-272-1705**. The fax phone number for the organization where this application or proceeding is assigned is **571-273-8300**.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. K./
Examiner, Art Unit 2814

/Phat X Cao/
Primary Examiner, Art Unit 2814